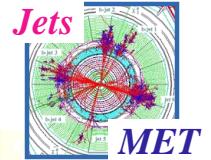




HCAL TRIGGER : HO



Salavat Abdullin, UMD



- 👉 **HCAL trigger simulation in ORCA**
- 👉 **The idea to use HO in the trigger (muon ?)**
- 👉 **Is it feasible at the current noise level ?**



■ Realistic noise

- Noise sigma per time bucket : 2 pe



hot : 1.5 pe !

■ HPD photo statistics effect

- sizeable for resolution at high energies

■ QIE integration in 25 ns time buckets

- ~ 91 % of the signal collected in 2 time buckets

■ ACD quantization

- Minimal ADC count = 3 pe ~ LSB of 330 (125) MeV in HB (HO)

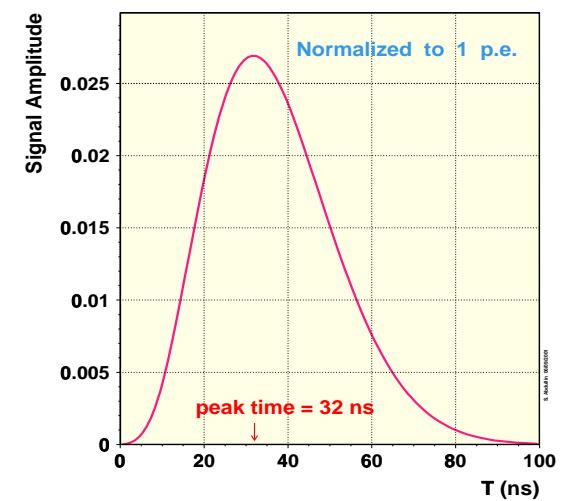
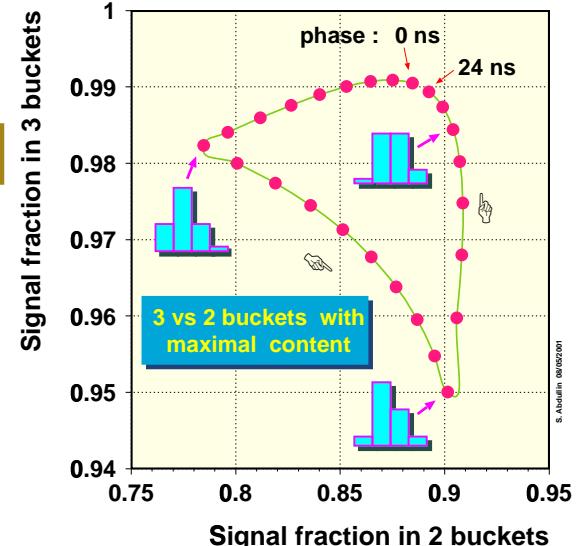
■ HF splitting from HB/HE

- and from ECAL !

- its own noise ~ 0.125 pe and ADC count ~ 0.43 pe

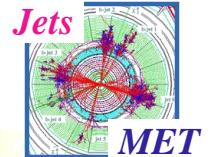
- 1 bkt signal integration

■ Layer 0 and 1 "optical" merging





TRIGGER PRIMITIVE SIMULATION IN ORCA



■ Signal reconstruction

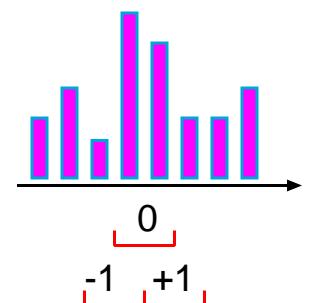
- conversion of digi to transverse ones(relevant for HF)
- use of sampling scale factors (not used if one readout per TrigPrim)
- sum of all readouts in tower: time bucket by time bucket
- just sum of 2 time buckets for each TrigPrim (tower)
- correction for partial signal collection (~ 90 %)

■ BCID

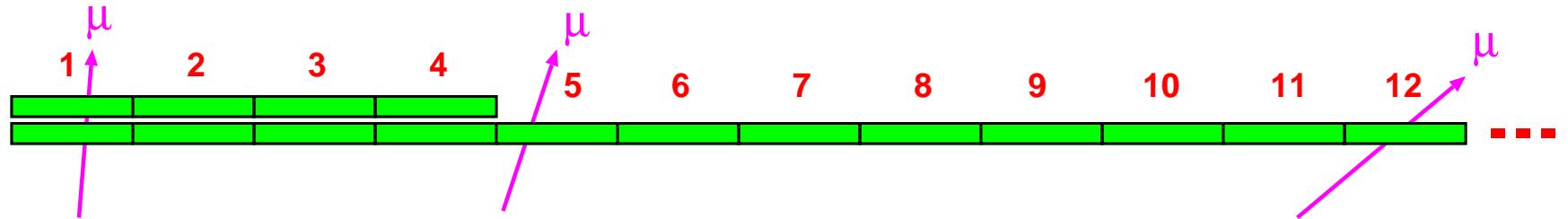
- shift +/- 1 time bucket is considered w.r.t. "nominal" position
- TrigPrim is taken only if "nominal" signal is the biggest one

■ Zero suppression

- 1 GeV (in L1 Calo Trigger by Sridhara Dasu)



CMSIM 121 + ORCA_5_3_1

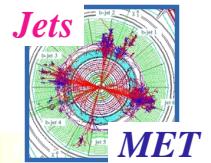


Updated HCAL readout simulation

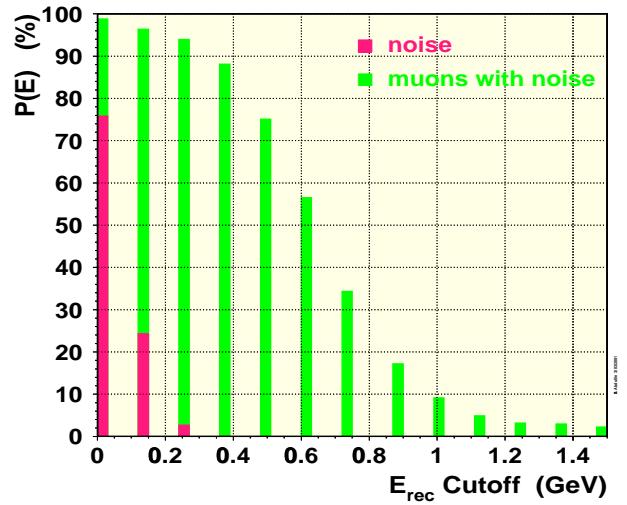
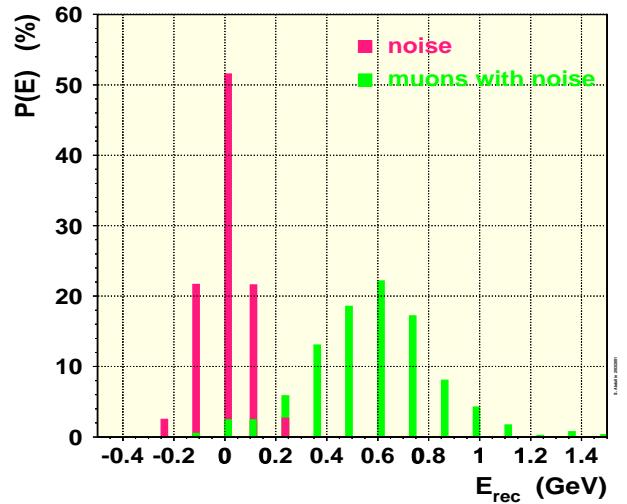
- Noise sigma per time bucket : 1.5 pe
- Singal collection in 2 time buckets (~ 90 %)
- ADC count : 3 pe, baseline position - 2d AC bin
- Muon signal : ~ 8 pe / scintillator -> 0.25 MeV / pe



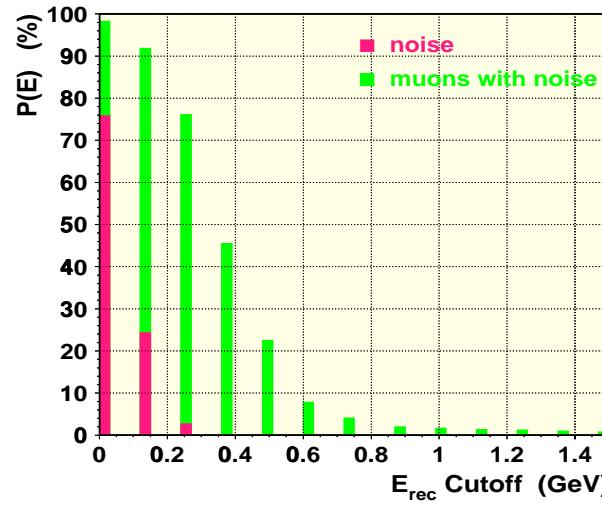
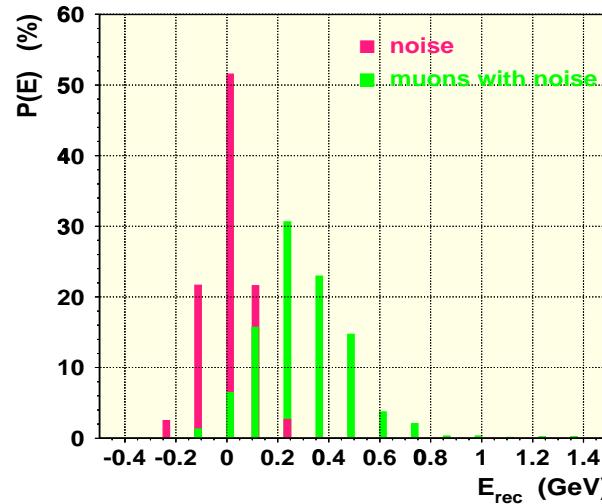
20 GEV MUONS VS NOISE



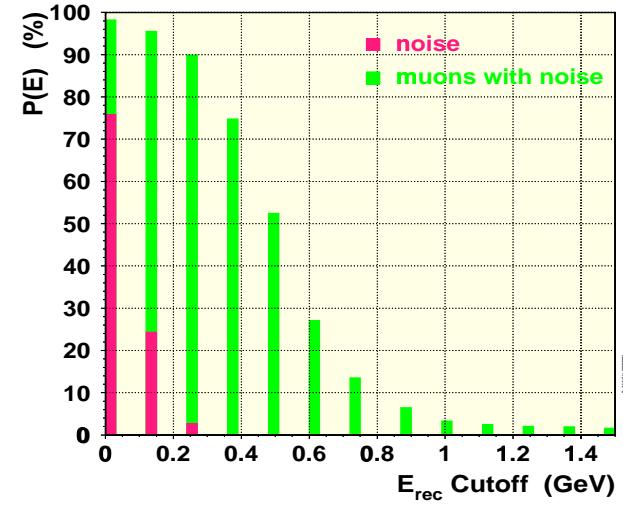
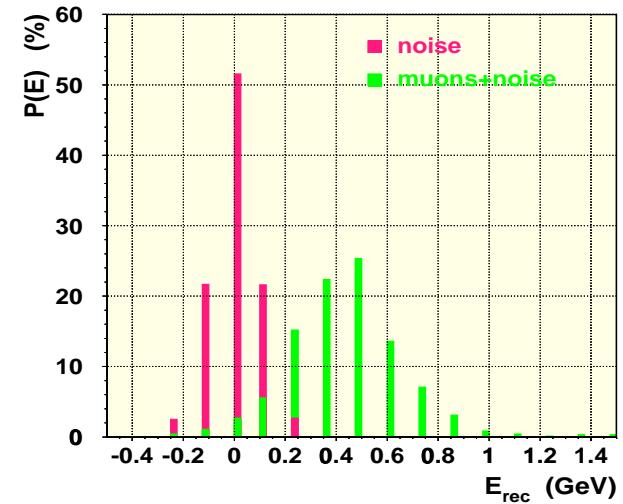
HO central ring (tower 1) :
two scintillator layers



HO first ring (tower 5) :
one scintillator layer



HO second ring (tower 12) :
one scintillator layer



HO central ring (1st tower) : two scintillator layers

